**Test #5, Gen Chem Covalent Exam Review Answers**

**When you review this, please remember that the questions in this review sheet are intended to give you an idea what’s on the test, but that anything I’ve asked you is fair game. If we’ve done a lab with it, done a worksheet on it, or if I’ve presented it in PowerPoint, you can be sure it’ll be on the exam in some form.**

**This sheet is intended to give you an idea of how ready you are. If you can do all of these questions without referring to another resource, you’re probably ready for the test. If not, then use this as a guide for things you should probably look at.**

1) Why do I refer to nonpolar covalent compounds as being like Tylenol capsules, but polar covalent compounds as being like Tylenol that’s had orange juice poured on it? In what way is this related to the structure of each? (6 pt)

**Nonpolar covalent molecules are basically big bunches of atoms that are all covalently-bonded to one another. There are no charges involved, there’s no + or -, and the atoms in these molecules are happy just how they are. The molecules don’t have any reason to interact with each other, so they’re as self-sufficient as Tylenol capsules.**

**In polar covalent molecules, there’s a little bit of polarity (i.e. a little bit of positive and negative charge) in different parts of the molecule. Though the molecules as a whole aren’t bonded to each other, this does give them the slight tendency to be attracted to each other. In this sense, they’re like Tylenol capsules, but a little sticky.**

2) What does the shape of a molecule have to do with its intermolecular force? (3 pt)

**If molecules are asymmetrical, then you can get an uneven distribution of charge within them. The stronger this asymmetry is, the more polar the molecule is and the more that molecules of this compound will be attracted to other molecules – this is strong in molecules with dipole-dipole forces and much stronger still in molecules that have OH, FH, and NH bonds, which cause hydrogen bonding. Completely symmetric molecules, however, are totally nonpolar and will only undergo Van der Waals forces, which are extremely weak.**

3) Why are covalent compounds generally less brittle than ionic compounds? (3 pt)

**Ionic compounds are brittle because the ions are tightly held together but when they move, the entire lattice sets up in a repulsive form between ions with the same charge. Covalent compounds don’t have any ions at all, so they’re not held tightly to each other and when they’re shifted, they just kind of drift apart.**

4) Explain how van der Waals forces work. (3 pt)

**If you have two nonpolar molecules, they’ll just sit around not interacting. However, if the electrons of one of these molecules becomes unbalanced, it will cause the other molecule to come unbalanced in response, which will lead to a weak force between temporary dipoles. Before long, the electrons just go back to where they were and the whole thing undoes itself, making this a very short-lived force.**

5) Why do polar molecules tend to have high melting and boiling points than nonpolar molecules? (3 pt)

**The molecules have partial positive and negative charges. This causes the molecules to be attracted to one another (far more so than in nonpolar molecules), which means that more energy will be needed to melt or boil them.**

For each of the following compounds, indicate the following:

a) Chemical name of compound. (1 pt each)

b) Lewis structure of compound. (3 pt each)

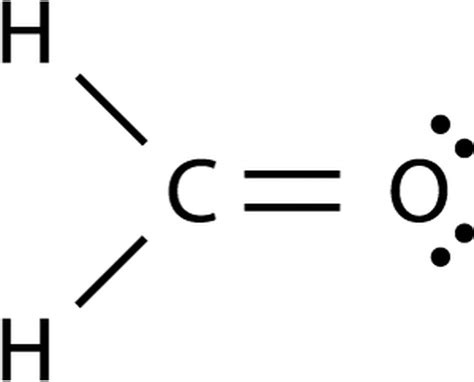
c) Shape of compound. (1 pt each)

d) Bond angle of the compound. (1 pt each)

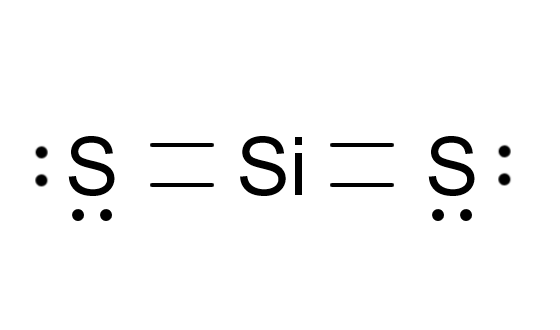
e) Indicate whether the molecule is polar. (1 pt)

f) Indicate the strongest intermolecular force in each compound. (1 pt)

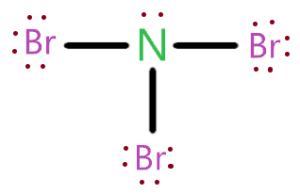
6) H2CO Lewis structure

* chemical name: Don’t worry about this one
* shape: **trigonal planar**
* bond angle: **120 degrees**
* is it polar? (yes/no): **yes**
* strongest intermolecular force: **dipole-dipole**

7) SiSe2 Lewis structure

* chemical name: **silicon diselenide**
* shape: **linear**
* bond angle: 1**80 degrees**
* is it polar? (yes/no): **no**
* strongest intermolecular force: **van der Waals forces**

8) NBr3 Lewis structure

* chemical name: **nitrogen tribromide**
* shape: **tetrahedral**
* bond angle: **109.5 degrees**
* is it polar? (yes/no): **yes**
* strongest intermolecular force: **van der Waals forces**